June 8, 2020
ELECTRONICALLY FILED VIA ECFS

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington DC 20554

Re: ET Docket No. 19-138
**   Ex Parte Presentation**

Dear Ms. Dortch:

Three of the most important questions in this proceeding are the following:

1. Are there V2X safety-of-life applications that will be prevented if only 30 MHz in this band is left for V2X?

2. If there are, will the Commission if it adopts the initial proposal most likely prevent forever, and at a minimum delay for a decade or more, the implementation of these safety-of-life applications in the U.S.?

3. Does V2X need to retain the other 45 MHz in this band because there are no other safety applications in other bands or other technologies that will prevent the same traffic deaths that the V2X applications can prevent?

These are three simple questions, with three simple answers. As discussed below, the answer to each of these questions is "yes".   As a result, if the Commission adopts the initial proposal, numerous Americans will needlessly die in traffic accidents.

1.   **CPM Safety-of-Life Applications and MCM Safety-of-Life Applications Will be Prevented If Only 30 MHz in this Band is Available for V2X**

If the Commission adopts the initial proposal and retains only 30 MHz for V2X in this band, given that critical Basic Safety Message ("BSM") applications must and will remain for V2X and in light of the spectrum needs for such applications, it will be **mathematically impossible** for Collective Perception Messages ("CPM") safety-of-life applications and Maneuver Coordination Messages ("MCM") safety-of-life applications to be meaningfully deployed in this band. For each of those message types (CPM and MCM), safety-of-life applications will require 20 to 30 MHz of spectrum, so that in total they will require 40 to 60 MHz. This is in addition to the requirements of BSM applications. Accordingly, if the Commission adopts the initial proposal, the numbers simply won't add up -- to the detriment of the safety and well-being of the American public.

A.   **CPM Safety-of-Life Applications**

CPM may sometimes be referred to as collective perception messages, cooperative sensing driving, sensor sharing, or object sharing. Regardless of the nomenclature, what is critical here is what CPM safety-of-life applications will actually do. They will greatly reduce the number of traffic deaths and serious traffic accidents involving vulnerable road users ("VRUs"), which include pedestrians, bicyclists, scooter riders, roadway workers, motorcyclists and others who are not in a vehicle when they are struck by a vehicle. These individuals sadly often have little to no chance whatsoever to avoid at the very least a serious injury when they are struck head-on by a vehicle, and

the result unfortunately is quite frequently death.   CPM safety-of-life applications will also greatly reduce traffic deaths and serious accidents that would otherwise arise between connected vehicles and those vehicles that are not connected.   CPM applications, which will be so important to saving lives, are often described as "seeing through the eyes of others," for the reasons shown below.

Some in this proceeding have wrongly speculated that because BSM applications will not need more than 30 MHz, V2X as a whole does not need more spectrum than that.   CPM applications alone (without even considering MCM applications discussed in the next section) are critical and will save numerous lives and prevent accidents in instances where even BSM applications cannot. BSM applications can prevent two connected vehicles from incurring a serious and often fatal accident even where there is no line of sight until it would ordinarily be too late to avoid the collision (such as where a building is blocking their view of each other).   However, what is equally important to be aware of is what BSM applications cannot do -- yet what CPM applications can do – which include the following:

- **Saving VRUs from Needless Deaths and Serious Injuries** – CPM applications can prevent connected vehicles from killing VRUs, such as pedestrians, bicyclists, scooter riders, motorcyclists, and roadway workers, where the driver of the vehicle does not have sufficient line of sight to the VRU, but either connected infrastructure or another connected vehicle can see the VRU and communicate the critical information about the VRU to the first vehicle, thereby enabling the first vehicle to stop in time. See Figures 1A and 1B below.

Figure 1A: CPM is "seeing through the eyes of others" such as for pedestrian protection at intersections. Source of graphic: © Car2Car Communication Consortium
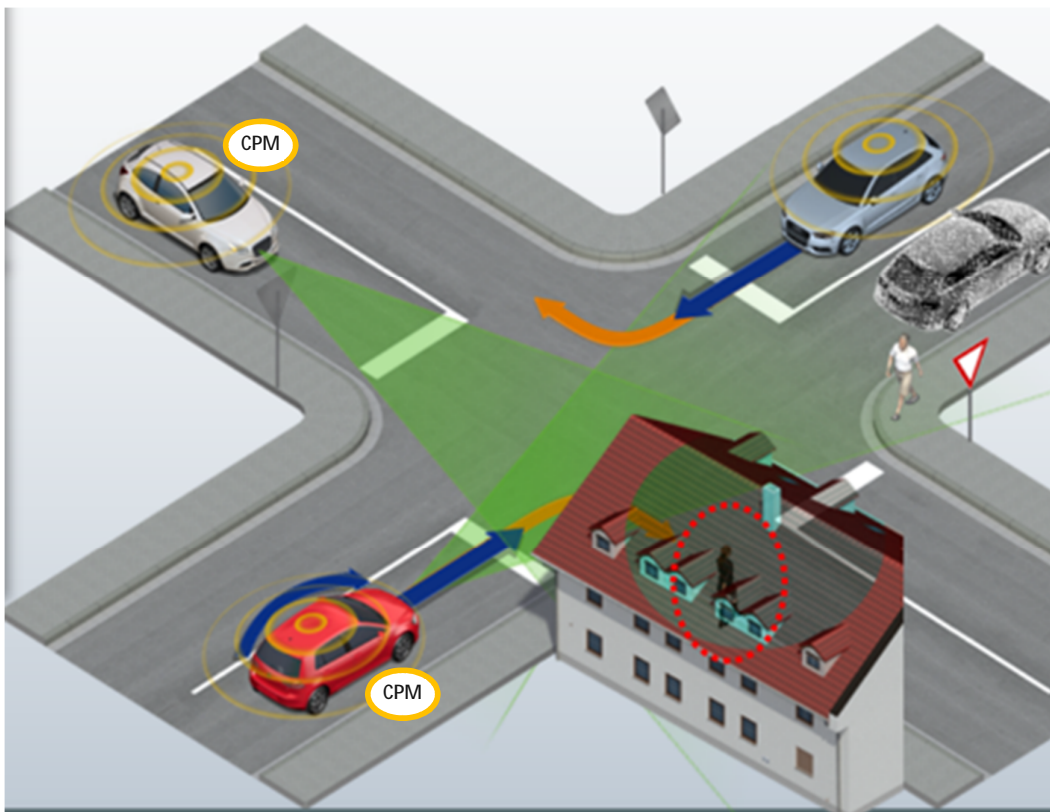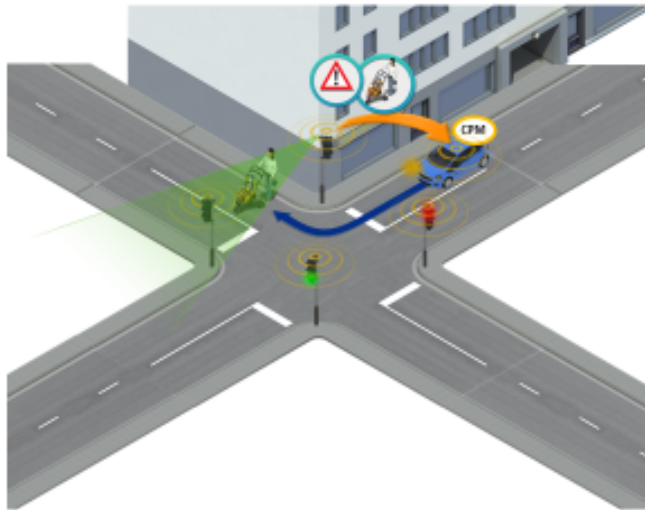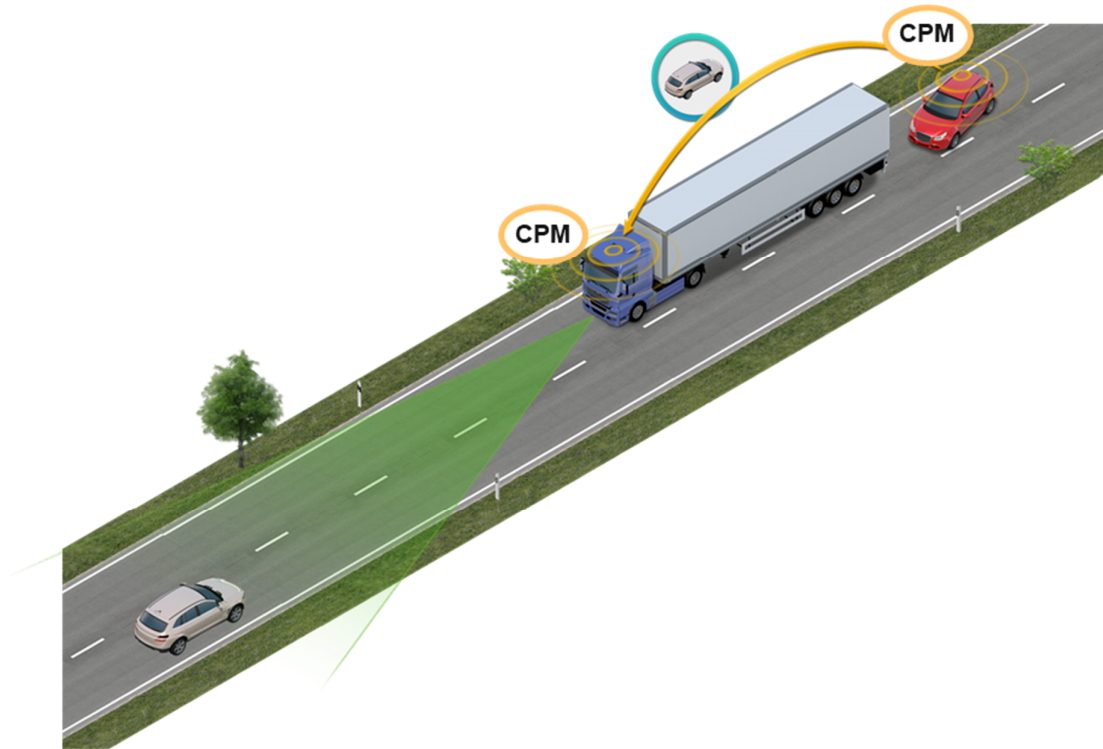
Collective Perception (CPM) enhanced smart intersection for VRU protection

- **Saving Drivers and Passengers of Vehicles from Needless Deaths and Serious Injuries in the Following Circumstances** – CPM applications can prevent a connected vehicle from crashing into an unconnected vehicle where the two vehicles do not have sufficient line of sight, but where either connected infrastructure or a separate connected vehicle (that does have line of sight with the second vehicle) notifies the first connected vehicle of that information, enabling the first vehicle to change its course of action in time. See Figure 2 below.

These are just some examples of how CPM applications will allow one driver to "see through the eyes" of another driver or of other infrastructure to save lives and prevent serious accidents. Rather than such instances and similar scenarios resulting in fatal accidents that are life-ending for the victims and life-altering for their families, they become nothing more than at most a close call (a "whew moment") and perhaps not even that. That's what CPM applications can do and will do unless the 45 MHz is snatched away from V2X in this proceeding.

B.   MCM Safety-of-Life Applications

MCM may sometimes be referred to as maneuver coordination messages, trajectory or intention sharing, cooperative driving, or cooperative automated driving. Again, regardless of the nomenclature, what is critical here (just like with CPM) is that MCM applications will greatly reduce traffic deaths and serious accidents in the U.S. if the spectrum remains for it to do so. While CPM applications are in essence about "seeing through the eyes of others," MCM applications are in essence about "seeing what others are about to do." That is, MCM applications will allow a second vehicle to know more than just what the first vehicle is currently doing – it will provide information describing what the first vehicle is about to do. That extra knowledge – essentially seeing ahead in time – can be the difference between a fatal crash and no accident at all. With MCM applications, connected vehicles will exchange information with each other regarding their intended driving paths to avoid serious and often fatal accidents. MCM applications will also greatly advance automated driving and make it much more efficient and seamless with other traffic (much less stop-and-go), which will also have significant safety advantages. Two examples of how MCM applications will enable drivers to prevent otherwise serious and sometimes fatal crashes are as follows:

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- **Preventing Serious Accidents and Deaths Where Two Drivers Do Not See That They Are Each Trying to Merge Into the Same Lane** – For example, a driver in the left lane on a highway and a driver in the right lane may both decide to merge into the middle lane, but they may be unable to see each other before it is too late. Unfortunately, this often results in serious and sometimes fatal accidents. But with MCM applications, if the vehicles are connected, each vehicle can know of the other vehicle's intention before the merger occurs and therefore either of them can take preventive action to avoid the accident. See Figure 3 below.

Figure 3: MCM enhanced cooperative lane change source graphics: © Car2Car Communication Consortium
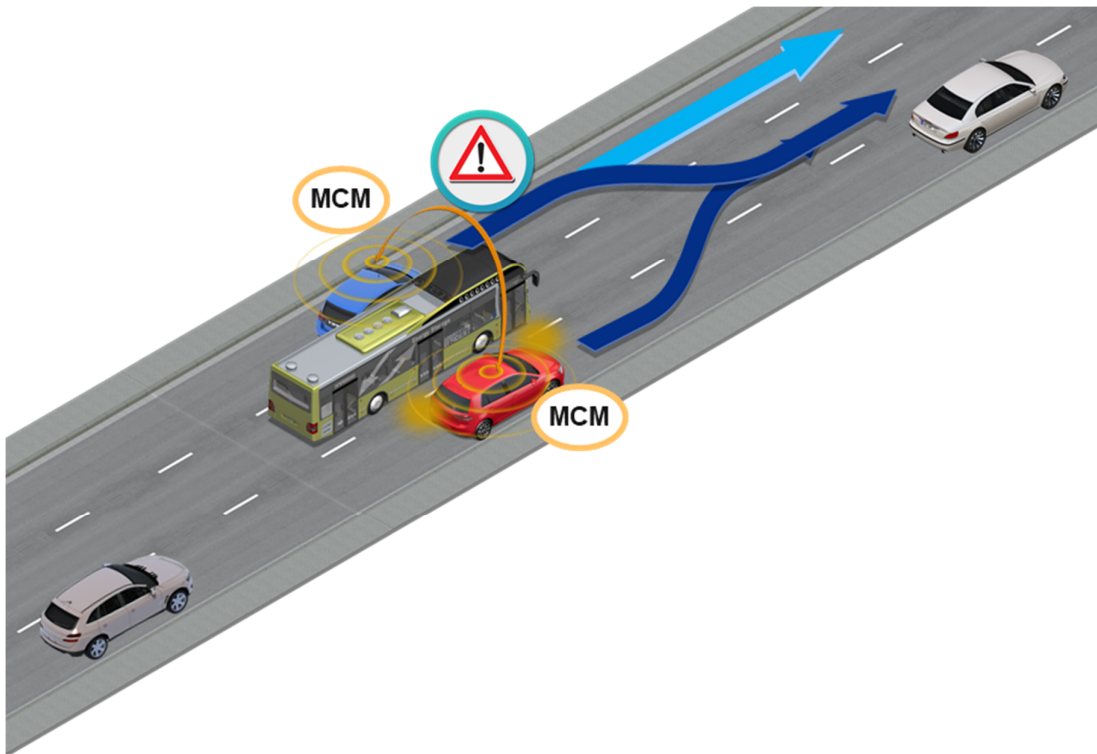
- **Preventing Serious Accidents and Deaths Where Fully Automated Cars are on the Road** – Without MCM applications, fully automated vehicles will engage in a lot of stop-and-go driving that can lead to, among other things, being rear-ended by unsuspecting drivers. With MCM applications, these fully automated vehicles can operate much more like all other vehicles on the road so that the stop-and-go operations of such vehicles will be largely eliminated.

2. **If the Commission Adopts the Initial Proposal, Such Action Will Most Likely Prevent Forever, and at a Minimum Delay for at Least 10 to 20 Years, the Implementation of CPM Safety-Of-Life Applications and MCM Safety-Of-Life Applications in the U.S.**

If the Commission adopts the initial proposal, such will result in disaster for CPM safety-of-life applications and MCM safety-of-life applications to the detriment of the safety of the American public. If the Commission takes that approach, the only question is whether those applications will be forever foreclosed in the U.S. or whether they will eventually become available after more than a

decade, and more likely at least two decades, of lost lives later than they otherwise would have been. Neither result should be acceptable.

If the Commission adopts the initial proposal, CPM safety-of-life applications and MCM safety-of-life applications will most likely never be available in the U.S. because it will be extremely difficult, and most likely it will be impossible, to find 45 MHz of spectrum in some other theoretically suitable band for V2X that does not have disqualifying restrictions. Most bands (i.e. any above 6 GHz) are not suitable for the functionality of V2X and are therefore non-starters. Bands that otherwise could be potentially suitable are generally highly congested. Even those theoretically suitable bands that are not as congested have incumbent users that would require restrictions likely making V2X unworkable in those bands. Some Wi-Fi supporters, for example, have suggested the 4.9 GHz band, but even a cursory review of that band shows that such band would not be viable for V2X for a multitude of reasons involving the type of existing users in that band and the restrictions that would be imposed on V2X.

And even if somehow sufficient spectrum from some other suitable band could be found – which is highly unlikely – and even if V2X was given the right to use it (which would be far from certain given that many other interests would likely also be competing for that spectrum if it was actually available and did not have disqualifying restrictions), displacement of 45 MHz for V2X from the 5.9 GHz band and relocation of it to that other band would delay deployment of CPM safety-of-life applications and MCM safety-of-life applications in the U.S. for an extremely long time: by more than a decade and most likely at least two decades longer than would otherwise have been the case. And even in that "best case scenario" if the initial proposal is adopted, countless Americans would needlessly die on the road during that long delay as a result.

The fact of the matter is that CPM safety-of-life applications and MCM safety-of-life applications will be available in the near future unless the 45 MHz is pulled from V2X in this proceeding. The standards for CPM applications will be finalized this year, and the standards for MCM applications will be finalized soon thereafter. CPM applications are already in product development, and deployment of these life-saving applications can, and we expect will, be launched by 2024-2025 if the Commission does not prevent that from occurring as a result of its decision in this proceeding.

In stark contrast, if the 45 MHz in this band is taken away from V2X in this proceeding, the most likely result, as discussed above, will be that CPM and MCM safety-of-life applications will never be deployed in the U.S. because of the following two facts: (1) for CPM and MCM applications to properly function, higher spectrum bands simply won't work – the spectrum must be below 6 GHz, and (2) there is not sufficient spectrum below 6 GHz that would be available that would not have disqualifying restrictions.   Moreover, even if such spectrum did somehow become available without such disqualifying restrictions, there likely would be numerous interests fighting over gaining access to it, and it would be far from certain that V2X would even get rights to use it.

But even if other spectrum below 6 GHz was somehow available that did not have disqualifying restrictions, and even if V2X did gain rights to use it, the delays caused by starting over would add at least a decade, and most likely two or more decades, to the time period before CPM and MCM applications would be deployed here, as compared to if this spectrum is not taken from V2X in this proceeding. The reason that the delays would be that long at a minimum is because all of the following would need to occur before such spectrum could be utilized by V2X:

o   A NPRM for start-over spectrum: qualify spectrum / execute spectrum studies against existing radio services, find interference mitigation strategies to protect

existing radio services, analyze the shortcomings of such mitigation strategies for V2X and test if V2X functions still fulfill their requirements / regulation

- o   Lab and field testing

- o   Standards & regulation & certification development

- o   Chipset development

- o   Product development

- o   Negotiating spectrum sharing agreements with incumbents

- o   Rollout

3.   **V2X Needs to Retain the Other 45 MHz in this Band Because There are No Safety Applications in Other Bands or Other Technologies that Will Prevent the Same Traffic Deaths that the V2X Applications Can Prevent**

Radar, cameras, Lidar, are important for auto safety, and they can prevent a lot of traffic accidents. But unfortunately there are many circumstances in which they simply cannot provide what is necessary to prevent fatal or serious traffic accidents. And that is where V2X comes into play, and for the purposes of this filing where specifically CPM applications and MCM applications can save the day – and save our, or our loved ones' or friends', lives. Those other technologies, such as radar, cameras, and Lidar, are based on line of sight, so when that doesn't exist, they simply are not able to prevent calamities. Not surprisingly so many accidents and fatalities occur because the drivers of the colliding vehicles, or the driver of one vehicle and a VRU, do not see each other until it is too late to prevent it. It is sad, it is tragic, and people often say it was unpreventable – but in fact these accidents will ordinarily be preventable if the spectrum remains for V2X, including for CPM applications and MCM applications, to prevent them. In fact, nearly half of all accidents[1] cannot be prevented by the other technologies alone, but need V2X to save the day.[2]

Moreover, nearly half of all VRU accidents,[3] such as accidents involving cars and trucks crashing into pedestrians, bicyclists, roadway workers, scooter riders, or motorcyclists, cannot be prevented by other technologies and unfortunately also not at all by BSM. There is no application or technology other than CPM applications that will be able to save these vulnerable road users where line-of-sight is not available.

Accordingly, the Commission should do everything it can to make sure important V2X technologies, including CPM applications and MCM applications, are not prevented altogether in the U.S. nor delayed by at least more than a decade as a result of the decision in this proceeding.

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[1] Overall up to 50% of all vehicle vs vehicle road traffic crashes can be addressed by ADAS. These include crashes caused by conflicts between two vehicles such as turning, crossing, rear-ending and oncoming crashes. Source: German Federal Highway Authority. Requirements to ADAS from the road safety perspective, https://www.bast.de/BASt_2017/DE/Publikationen/Archiv/Infos/2007-2006/11-2007.html.

[2] Cellular communication (over e.g. 4G, 5G networks) is also not the solution for many reasons, including that it is not available in many locations, it does not provide sufficiently low latency at all times, and the (IMT) spectrum would be too congested.

[3] The effectiveness of preventing vehicle vs VRU crashes using in-vehicle perception ADAS is estimated to be 55%. These include crashes between vehicles and VRUs such as pedestrians, cyclists and motorcyclists. European H2020 research project PROSPECT, PROactive Safety for PEdestrians and CyclisTs, analyze and tested in-vehicle perception ADAS to protect VRUs, finalized 2018. Deliverable D2.3 can be found here: https://ec.europa.eu/inea/en/horizon-2020/projects/H2020-Transport/Safety/PROSPECT

Sincerely,

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